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# Compilation of Data on Wing Homoeosis on Lepidoptera: Supplement I

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**Abstract.** Twenty-five mostly new examples of wing homoeosis are recorded to supplement the previously published list of wing homoeosis in Lepdioptera. They include examples of mosaics in Zygaenidae and completely bilateral posterior ventral mosaics in a papilionid species *Luehdorfia japonica*, apparently genetic mutants.

## Introduction

Further material is now available to supplement the data on wing homoeosis in Lepidoptera, as compiled by Sibatani (1983). Since the new data, and existing records which were overlooked by Sibatani (1983) contain some interesting findings, they are now reported here, insofar as they contribute to the general theory of wing homoeosis in Lepidoptera.

The additional material of 25 homoeotic examples will be recorded here in the same format as in the previous report, although the specimen number is no longer in convenient sequence for individual higher taxa. In order to provide convenience for cross references between the original and supplementary lists, a related reference number (or numbers) of the same series (B or D) in the original list is/are given in parenthesis after the new number in the following supplementary list. Extending the same reference method to the Addenda contained in the original list of Sibatani (1983), B284-B302 should read B284(14)-B302(14). Where a number such as B2+ appears, the "plus" sign signified that further information is now added to the entry B2 in the previous list. When referring to such numbers in the text, however, these additions will usually be dropped and plain numbers be used, such as B2, B302, or B304.

## List of specimens with homoeosis in Lepidoptera. Supplement I.

### 1. Fore/hindwing homoeosis

#### Zygaenidae

B2+ *Zygaena occitania* de Villers ♂ France BMNH†

B5+ *Zygaena filipendulae* Linnaeus ♂ UK: Queendown Warren bred 10 v Crocker BMNH†

B6+ _____ ♂ UK: Herts., Royston 4 viii 23 T.H.L. Grosvenor BMNH†

B303(4) *Zygaena carniolica* Scopoli ♂ France: Alpes Maritimes (*Oberthur*) BMNH† DLH

B304(5) *Zygaena filipendulae* Linnaeus ♂ UK: Sussex, W. Horsham 18 vi 42 M. J. Heard BMNH† DVRF

B305(9) *Zygaena trifolii* Esper ♂ UK: Witley 1 v 20 A. A. Tullett (*Cockayne-Kettlewell*) BMNH† DRH

B306(9, ?8) _____ (? *lonicerae* Esper) ♂ No data (*Bright/Rothschild*) BMNH† WLH

**Papilionidae**

B307, 308(14, 284) *Luehdorfia japonica* Leech ♀ Japan: Nakamura 1980: 109*(†) VLRF

B309(14, 284) _____ ♀ Japan: Nagano-ken, Kitaazumi-gun, Shirouma-mura, Hosono em. 23 iv 71 (*Y. Furihata*) Nishimura *in litt.* 1982 No. 6(†) VRF

B310(14, 302) *Luehdorfia puziloi* Erschoff ♂ Japan: Nagano-ken, Higashichikuma-gun, Hatamachi, Kurosawa, Sagisawa 9 iv (*Y. Fukasawa*) Nishimura *in litt.* 1982 No. 5(†) VLF

B311(14, 302) _____ ♂ Japan: Nagano-ken, Kitaazumi-gun, Hakuba-mura, Moriue em. 5 iv 78 (*K. Maruyama*) Nishimura *in litt.* 1982 No. 2(†) VRLF

B312(14, 302) _____ ♂ Japan: data as B311 Nishimura *in litt.* 1982 No. 1(†) VRLF

B313(27) *Papilio bianor* Cramer ♂ Japan: Oshima, Nakanogo-Sumiyoshi (*Nishimura*) Nishimura *in litt.* 1982 No. 8(†) VLH

**Pieridae**

B314(35) *Pieris brassicae* Linnaeus ♂ Europe: hybrid Canary Islands/UK; Gardiner 1963: 133* VRH

B315, 316(35) ♂ data as above but not * VH

B317(37) *Pieris rapae* Linnaeus ♂ Mexico: Shapiro 1983: 242 (†) VLH

B318(37) _____ ♀ Mexico: Shapiro 1983:242 (†) VLH

**Lycaenidae**

B72+? *Lycaena phlaeas* Linnaeus N. Devon; ? = *Rumicia phlaeas* UK: Cockayne 1922: 16 (North Devon [South]) VLH; N.B.—"Leech" appears in the line next to that which records *phlaeas* collected by South at "N. Devon" 1881 in *Proc. South Lond.*

*Ent. and n.H. Soc.* 1888: 40

B319(62) *Fixenia iyonis* Ota and Kusunoki ♂ Japan: Nagano-ken, Shimoina-gun, Minamishinano-mura, Yanase em. 20 v 80 (*K. Maruyama*) Nishimura *in litt.* 1983 No. 4(†) VRH

B320(66) _____ (as *Rumicia*) UK; Cockayne 1922: 16 (I. of Wight [*South*]) VH

B321(66) _____ (as *Rumicia*) USA: [near New York City] 30 v 1879 E. Norstrand; Cockayne 1922: 16 VRH

B322(106) *Chilades cleotas* Guérin ♀ Papua New Guinea: (*R. Mattoni*) Mattoni *in litt.* 1982 (†) VRLF

B323(106) _____ ♂ Papua New Guinea: Keravat 8 x 72 (*A. Sibatani*)† VRF

**Nymphalidae**

B324(154) *Melitaea cinxia* Linnaeus ♀ UK: Cribb 1981: 22* VLH

B325(162) *Melitaea diamina* Lang ♂ S. Korea: Kwangrung 82 (*M. Nishimura*) Nishimura *in litt.* 1982 No. 9(†) VRF

B326(162) _____ ♂ S. Korea: Kwangrung 17 vi 77 (*M. Nishimura*) Nishimura *in litt.* 1982 No. 10(†) VRLF

## 2. Dorsal/ventral wing homoeosis

**Lycaenidae**

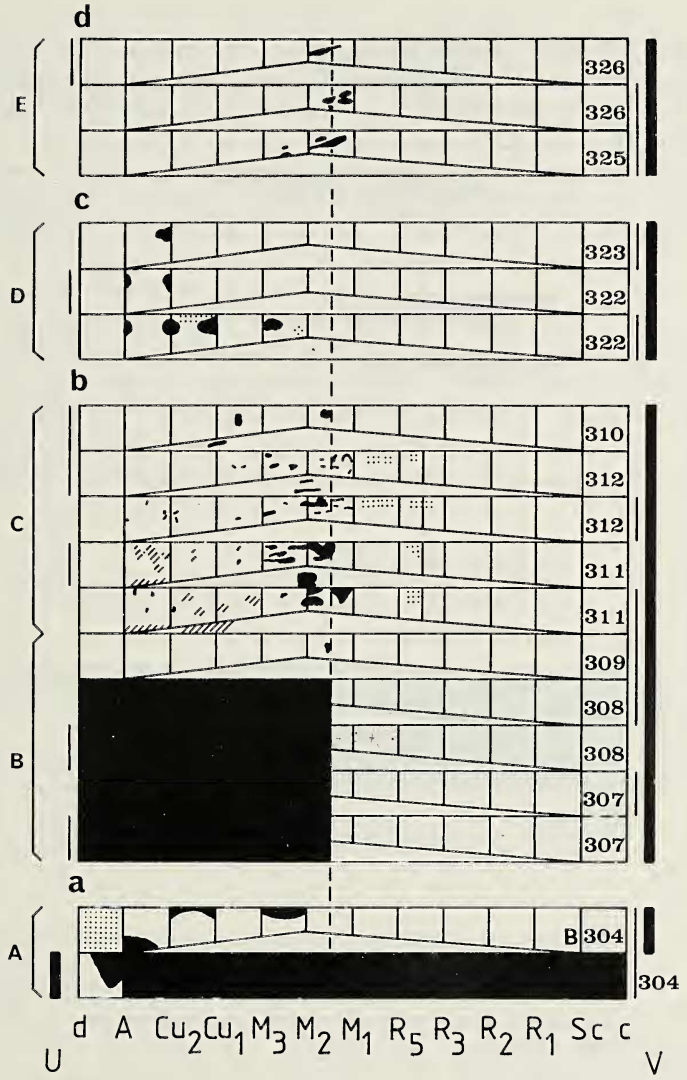
D32(23) *Lysandra coridon* Poda ♀? UK Bright and Leeds 1938: 61 (*W. Rait-Smith*) DRLF

### Diagrammatic Representation

All the homoeosis examples included in the supplementary list and a few in the original list are illustrated in Figures 1-3 in the same diagrammatic format as given in Figures 1-12 in the previous report (Sibatani, 1983).

### Comments

1. In *Zygaenidae*, the only previously-known examples of wing homoeosis were entire fore/hindwing (F/H) conversions. We now have examples of mosaic F/H homoeosis. In *Zygaena filipendulae* B304, the dorsal surface of the right forewing is almost completely homoeotic (there being a small autotypic area along the dorsum), whereas on the ventral surface small allotypic patches are found along the termen (Fig. 1(a), A). This virtually represents a complete mosaic of the dorsal surface with its boundary slightly deviating from the wing margin. The homoeotic mosaic of *Z.*




Figs. 1-3. Maps of homoeotic mosaics in Lepidoptera wings. Supplement I. See Figs. 1-12 of Sibatani (1983) for general information about the format, symbols, etc.

Figs. 1-2. F/H homoeosis.

Fig. 1. Forewings. (a) Zygaenidae—A, *Zygaena filipendulae* Linnaeus. (b), Papilionidae—B, *Luehdorfia japonica* Leech; C, *Luehdorfia puziloi* Erschoff. (c), Lycaenidae—D, *Chilades cleotas* Guérin. (d), Nymphalidae—E, *Melitaea diamina* Lang.

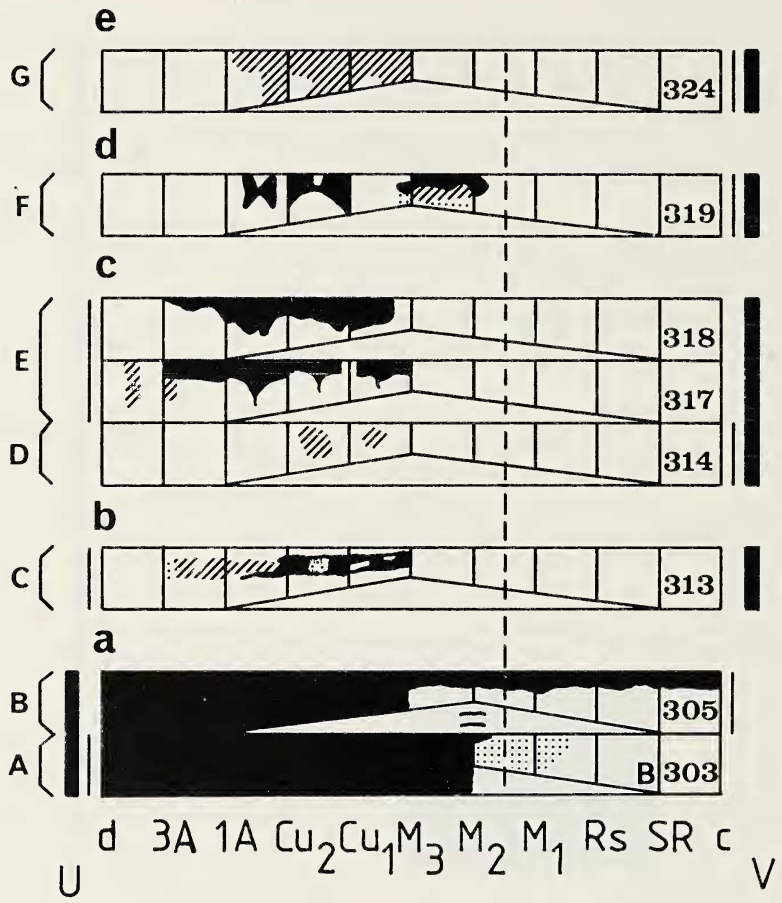



Fig. 2. Hindwings. (a), Zygaenidae—A, *Zygaena carniolica* Scopoli; B, *Zygaena trifolii* Esper. (b), Papilionidae—C, *Papilio bianor* Cramer. (c), Pieridae—D, *Pieris brassicae* Linnaeus; E, *Pieris rapae* Linnaeus. (d), Lycaenidae—F, *Fixenia iyonis* Ota and Kusunoki. (e), Nymphalidae—F, *Melitaea cinxia* Linnaeus.

*carniolica* B303 is roughly confined to the posterior half of the dorsal surface of a hindwing, whereas in *Z. trifolii* B305 part of the homoeotic patch in the posterior half of a hindwng spreads to the terminal area of the anterior half of the wing (Fig. 2(a) B,C).

2. In Papilionidae, *Luehdorfia japonica* has now provided two females having a bilaterally symmetrical complete posterior-dorsal F/H homoeotic mosaic on the forewing ventral surface (Nakamura, 1980); (Fig. 1(b), B).

The patterning on the corresponding dorsal surface is aberrant but undoubtedly autotypic. The wing form of these somewhat dwarfish specimens (Figs. 5, 6) is also subject to slight F/H-homoeotic change, showing a constriction at the autotypic/allotypic boundary along the termen. These specimens are remarkable in that the complete posterior mosaics are bilaterally symmetrical and obtained in duplicate, in the same local/seasonal population: a fact which strongly indicates that they are genetic mutants. The mosaic border runs along the midline of space $M_1$-$M_2$ and discal cell, in support of the inferred boundary of anterior and posterior compartments (Sibatani, 1980).

As Fig. 1 indicates, most of the F/H-homoeotic examples reported here represent homoeosis of the posterior half of the wing, but in *Luehdorfia puziloi* (Fig. 1(b), C) most examples show, in addition to the bulk of homoeotic patches caudad of $M_2$, minute mosaics distributed on both sides of the $M_1$-$M_2$ barrier.

3. New homoeotic examples are now recorded from the Australian region: Papua New Guinea, with a plebejine species of Lycaenidae: *Chilades cleotas*.

4. In Lycaenidae, a large number of F/H homoeoses on the ventral hindwing has been recorded for British specimens of *Lycaena phlaeas* Linnaeus (Sibatani, 1983). Not a single case of homoeosis for this common species has so far been known from Japan, although quite a number of homoeotic butterflies has been recorded from that country (Sibatani,

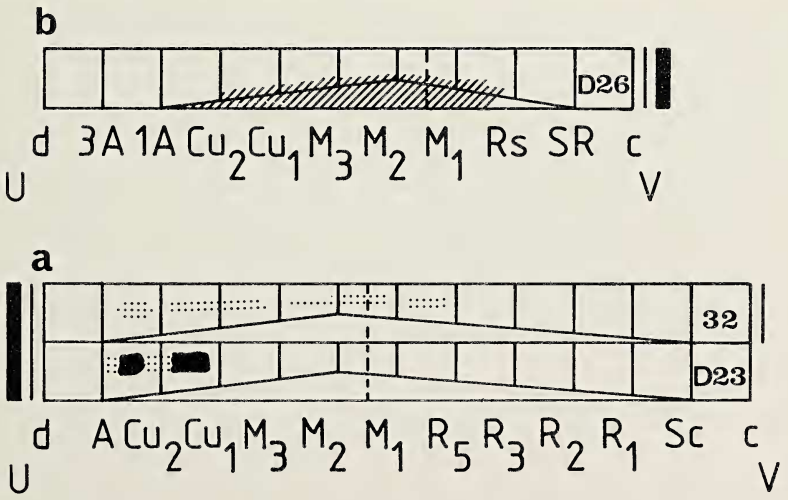



Fig. 3. D/V homoeosis: Lycaenidae—*Lysandra coridon* Poda. (a), forewings, (b), hindwing. See the list of Sibatani (1983) for D23 and D26.

**Fig. 4.** B309

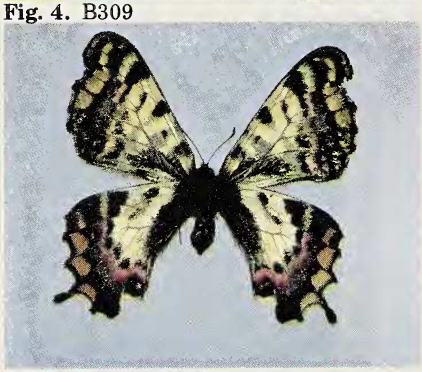


**Fig. 5.** B308.

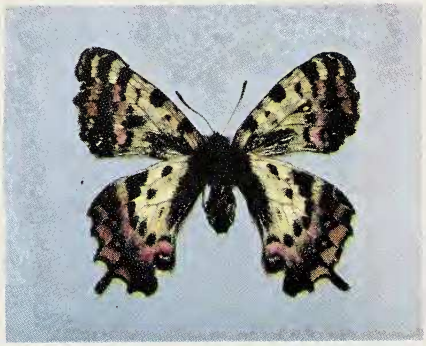


**Fig. 6.** B307.

1983). *There is one record of homoeotic* L. phlaeas *from the U.S.* (B321). Of interest therefore is the sample size of British specimens of this species among which large numbers of homoeosis were found. One such estimate is 1:500-1:1000 (Robertson, *in litt.*). I had an opportunity to examine 858 specimens of this species from Japan (mainly from Kyoto area) in the T. Minoura collection now housed at the Osaka Prefectural University School of Agriculture, but failed to find any examples of homoeosis. It would seem that the Japanese race of *L. phlaeas* is possibly less prone to become homoeotic than that in the British Isles.

5. In *Melitaea/Mellicta* (Nymphalidae), only extremely patchy mosaics on the ventral forewing have been known and these in only 3 of the European species. The same trend is now observed in a species from Korea: *Melitaea diamina* (B325, 326). However, there is now one example of *Melitaea cinxia* (B324) from U.K. which shows on the ventral surface of a hindwing an F/H conversion in a rather large mosaic patch.

*Acknowledgments.* I express my great appreciation of the assistance given me to reach and examine most of

Figs. 4-6. F/H homoeosis on the forewing ventral surface of *Luehdorfia japonica* Leech (X 0.8).

Use Fig. 4 with a very minute homoeotic patch on the right forewing (left in the figure), for the autotype patterning in comparison with allotypic areas of Figs. 5 and 6.

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